

NON UNIFORMITY OF THE ANODE
CURRENT DISTRIBUTION
IN COLD CATHODES BASED ON THIN
FILMS OF RARE-EARTH CHALCOGENIDES

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In planar cold cathodes making use of semimetallic thin films to achieve low or negative electron affinity [1, 2], the effects of DC current crowding [3] can be affected by the trapping of electrons being reflected towards the cathode as a result of space-charge effects in the vacuum gap between cathode and anode [4]. A self-consistent solution of the interplay between current crowding and space-charge effects can lead to a non-monotonic lateral distribution of the anode current density depending on the width of the emission window. This behavior is in sharp contrast with the monotonic decrease of the anode current density from the edges towards the center of the emission window when space-charge effects in the vacuum region are neglected.

Numerical examples will be discussed where the anode current density increases above its value at the edges followed by a maximum before dropping again upon approaching the center of the emission window. These examples are for the case of a Metal/CdS/LaS cold cathode we have studied in the past when neglecting the interplay of current crowding and current self-quenching effects mentioned above. The theory is valid for any cathode based on current carrying thin films with low or negative electron affinity used to bias the cathode emission window.

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References

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